

Lake Erie.—Cleveland, Ohio: the schooner "C. Hutchinson" left this port for the Islands on the 14th; she obtained her cargo and returned, reaching here on the 20th, after having been fast in the ice off this place for several days. On the 28th the steamer "City of Cleveland" arrived from Detroit.

Lake Superior.—Duluth, Minn.: the lake at this point remained frozen solid throughout the month.

Detroit River.—Detroit, Mich.: the ice in the river moved out on the 2d, doing no damage; on the 3d the river was clear.

Hudson River.—Newburg, N. Y.: navigation on the river, between here and New York City, was reopened on the 11th. The steamer "Newburg," of the Homer Ramsdell Transportation Line, left this place at 1 a. m. and reached New York City in four hours. On the above date the river above Newburg was still covered with ice.

FLOODS.

Bismarck, Dak.: on the 16th the ice in the Missouri River at this point broke up and began moving down, but soon formed a gorge at a point about half a mile below the town, and at 3 p. m. the water had risen six feet. On the same day a gorge formed at Washburn, a town forty miles north of Bismarck. During the 17th the greater part of the ice in the Missouri River above the mouth of the Yellowstone began moving, but in the afternoon of the same day it gorged twenty-five miles below Fort Buford and flooded many miles of country. During the night of the 17-18th the gorge at Washburn gave way; in the morning the water began rising rapidly at Bismarck. Although the ice at this point was nearly solid from bank to bank, yet the flow of rapidly rising water broke it into large pieces,

some an acre in extent, forming a gorge at Sibley Island, five miles below the town. The water rose rapidly, overflowing the river banks, and on the afternoon of the 18th the river, which is usually at this point about three-fourths of a mile wide, had increased to five miles. A number of small buildings were carried away, and the telegraph line between Bismarck and Fort Lincoln was completely demolished. About 6,000 acres of meadow land south of Bismarck were covered to a great depth with water and ice flowing at the rate of about six miles per hour. The water continued rising until the 22d; from the 23d until the 26th it fell slowly, on the latter date the gorge at Sibley Island broke and the water receded rapidly. The river attained a greater depth during this flood than it did during the spring flood of 1881, causing great suffering and loss of property to settlers along its banks for miles above the gorge.

Sioux City, Woodbury Co., Iowa: the Missouri River rose rapidly at this point on the 25th, and during the afternoon attained a height but little lower than that of the high water of 1881. At points on the river above this town large areas of bottom lands were overflowed, and considerable damage done.

Yankton, Dak.: the Missouri River at this point reached its greatest height on the 26th, and the water backing into the James River did considerable damage to roads and railways. The track of the Milwaukee Railroad at Burbank, on the Sioux City and Dakota branch, was badly washed and traffic was delayed for several days. After the 26th the water subsided slowly.

Saint Joseph, Buchanan Co., Mo.: the Missouri River at this place overflowed its banks on the 28th and flooded about a square mile of the lowlands on the Kansas side.

ATMOSPHERIC ELECTRICITY.

AURORAS.

The auroral light was reported from very few stations during March, 1887. That which appeared on the night of the 20th-21st was the most extensively observed; it was visible at but one station in New England, Mount Washington, N. H., and one in the upper lake region, Escanaba, Mich., although generally clear weather prevailed in these districts; it was also reported from Saint Vincent, Minn., and two stations in eastern Dakota. The sky over the lower lakes and Ohio and Mississippi valleys was obscured by clouds. This aurora, as it appeared at Saint Vincent, was of a faint white color, and very dim; toward midnight it increased in brilliancy, but shortly after began to fade, and disappeared at 1.30 a. m.

An auroral light of moderate brilliancy was reported from nearly all stations in northern Michigan and one in northeastern Montana on the night of the 19-20th. This display probably extended from the Lake region to eastern Montana, but was obscured over the intervening region by the clouds which covered the sky. The light was most brilliant at Marquette, Mich., where it appeared in the form of a bright white arch, extending from azimuth 145° to 215°, and to an altitude of 45°. Several streamers were visible at 10.30 p. m.; the display disappeared shortly after 11 p. m.

On the night of the 1st-2d an aurora was visible at Tatoosh Island, Wash., but was reported from no other station, although clear weather prevailed over all portions of the country, except Montana, northern Dakota, and parts of the lower lake region and New England. It consisted of a pale white light, extending from 40° north to 55° south of the magnetic meridian, and to an altitude of 8°. At 12.20 a. m. streamers of a bright yellow color shot up to an altitude of 35°; they increased in number and brightness until 12.50 a. m. when the display began to diminish in intensity and had faded away at 1.35 a. m.

On the night of the 23d-24th an aurora was observed at a few stations in northern New England and one in New York. Clear weather prevailed over all parts of the country, except the upper lake region, Minnesota, and Dakota. At Burlington, Vt., it was quite brilliant, and was visible from 10 p. m. of the

23d until 1 a. m. of the 24th. Several streamers flashed up in the northwest at 12.30 a. m. to a height of 20°.

The place of observation and condition of the sky during the remaining displays are as follows:

On the 8th a very faint aurora was observed at Pekin, Ill., and Des Moines, Iowa; clear or fair weather prevailed in all northern sections of the country, except the upper lakes and upper Mississippi valley.

On the 13th, at Fort Totten, Dak., and Cresco, Iowa; sky clear, except in the Lake region and middle Atlantic states.

On the 15th, at Mackinaw City and Alpena, Mich., and Poplar River, Mont.; the sky was clear of clouds over the region lying between these stations.

On the 21st, at North Truro, Mass., and Nashua, N. H.; clear or fair weather prevailed over New England; to the westward as far as Wisconsin the sky was obscured by clouds.

On the 24th, at Gardiner, Me., Oswego, N. Y., Marquette, Mich., and Crete, Nebr.; the sky was clear in all portions of the country, except over the lower lakes and middle Atlantic states.

THUNDER-STORMS.

Thunder-storms occurred in the various states and territories, as follows:

Alabama.—Greensborough, 6th, 20th; Montgomery, 7th; Mobile, 8th, 20th, 31st.

Arizona.—Prescott, 24th.

Arkansas.—Lead Hill, 5th, 19th, 26th, 27th.

Colorado.—Pike's Peak, 19th; Denver, 30th.

District of Columbia.—Washington City, 27th.

Florida.—Archer, 8th, 9th, 17th, 20th, 26th, 27th, 28th; Jacksonville, 8th, 9th, 27th; Pensacola, 8th, 16th, 17th, 20th, 31st; Sanford, 8th, 27th, 28th; Tallahassee, 8th, 27th, 31st; Merritt's Island, 9th, 17th, 25th, 27th; Duke, 9th, 27th; Key West, 12th, 13th, 25th; Cedar Keys, 20th.

Georgia.—Forsyth, 7th; Atlanta, 7th, 27th; Milledgeville, 7th, 28th, 31st; Quitman, 8th, 27th, 31st; Savannah, 28th, 31st.

Illinois.—Charleston, 27th.

Indiana.—Butlerville and Sunman, 9th; Jeffersonville and Vevay, 9th, 27th.

Indian Territory.—Fort Sill, 8th; Fort Reno, 8th, 26th; Fort Gibson, 9th.

Iowa.—Des Moines, Cresco, Independence, and Monticello, 8th; Cedar Rapids, 8th, 19th.

Kansas.—Wyandotte, 8th; Globe and Independence, 8th, 19th, 26th; Wellington and Wakefield, 8th, 26th; Salina, 10th; El Dorado, 19th, 26th; Fort Riley, Emporia, and Manhattan, 26th.

Kentucky.—Harper's Ferry, 1st, 6th, 7th, 27th; Midway, 3d, 4th, 6th, 9th, 27th; Frankfort, 3d, 27th; Louisville, 9th, 27th.

Louisiana.—Shreveport, 6th, 7th, 29th; Grand Coteau, 7th, 8th, 10th, 20th, 27th, 31st.

Maryland.—Cumberland, 24th.

Mississippi.—Vicksburg, 7th, 20th, 27th.

Missouri.—Springfield, 26th; Saint Louis, Centreville, and Central College, 27th.

Nebraska.—Brownville, 8th, 26th.

New York.—Humphrey, 24th.

North Carolina.—Raleigh, 7th, 27th, 28th; Reidsville, 25th, 26th; Hatteras and Kitty Hawk, 21st, 28th, 31st; Lincolnton and Statesville, 27th, 28th; Charlotte, Wash Woods, Wilmington, Weldon, and Lenoir, 28th.

Ohio.—College Hill, Tiffin, and West Milton, 9th; Yellow Springs, 9th, 26th; Cleveland, Sandusky, and Elyria, 24th; Columbus and Portsmouth, 27th.

Pennsylvania.—Pittsburg, Grampian Hills, Phillipsburg and Wellsborough, 24th; Meadville, 25th.

South Carolina.—Spartanburg, 4th, 27th, 28th; Aiken, 7th; Stateburg, 7th, 28th; Charleston, 28th, 31st.

Tennessee.—Nashville, 3d, 4th, 6th; Memphis, 6th, 27th, 30th; Chattanooga and Milan, 27th.

Texas.—Palestine, 5th, 6th, 9th, 27th; Cleburne, 5th, 6th, 27th; Corsicana, 5th, 26th; Comfort, 6th, 9th, 19th; New Ulm, 7th, 8th, 9th; Galveston, 7th, 10th; Brownsville, Rio Grande City, and Austin, 8th; San Antonio, 9th; Corpus Christi, 9th, 27th.

Utah.—Salt Lake City, 18th.

Virginia.—Bird's Nest and Variety Mills, 28th.

Washington Territory.—Walla Walla, 16th.

Wisconsin.—La Crosse, 4th; Madison and Prairie du Chien, 8th.

RARE ELECTRICAL PHENOMENON AT SEA.

Capt. C. D. Swart, of the Dutch bark "J. P. A.," makes the following report of a remarkable phenomenon observed by him at 5 p. m. March 19, 1887, in N. 37° 39', W. 57° 00':

During a severe storm saw a meteor in the shape of two balls, one of them very black and the other illuminated. The illuminated ball was oblong, and appeared as if ready to drop on deck amidships. In a moment it became as dark as night above, but below, on board and surrounding the vessel, everything appeared like a sea of fire. The ball fell into the water very close alongside the vessel with a roar, and caused the sea to make tremendous breakers which swept over the vessel. A suffocating atmosphere prevailed, and the perspiration ran down every person's face on board and caused everyone to gasp for fresh air. Immediately after this solid lumps of ice fell on deck, and everything on deck and in the rigging became iced, notwithstanding that the thermometer registered 19° Centigrade. The barometer during this time oscillated so as to make it impossible to obtain a correct reading. Upon an examination of the vessel and rigging no damage was noticed, but on that side of the vessel where the meteor fell into the water the ship's side appeared black and the copper plating was found to be blistered. After this phenomenon the wind increased to hurricane force.

ELECTROMETER READINGS.

Observations of the electrical potential of the air were made during the month of March, 1887, at 9 a. m., 11 a. m., 1 p. m., and 3 p. m., daily, at Washington City, Baltimore, Md., New Haven, Conn., Boston, Mass., Ithaca, N. Y., and Columbus, Ohio. At Washington City, in addition to the regular series of observations, a set of simultaneous observations were made on March 24th at the Signal Office, elevation 45 feet, and at the top of the Washington Monument, elevation 500 feet. The following table shows, briefly, the results:

Time.	Monument.	Signal Office.	Difference.	Time.	Monument.	Signal Office.	Difference.
	Volts.	Volts.	Volts.		Volts.	Volts.	Volts.
12 m.	950	90	860	1.15 p. m.	825	825	0
12.05 p. m.	825	84	741	1.20 p. m.	875	42	833
12.10 p. m.	825	72	753	1.25 p. m.	850	60	790
12.15 p. m.	825	54	771	1.30 p. m.	925	54	871
12.20 p. m.	850	72	778	1.35 p. m.	900	60	840
12.25 p. m.	800	54	746	1.40 p. m.	875	48	827
12.30 p. m.	850	36	814	1.45 p. m.	950	60	890
12.35 p. m.	825	36	789	1.50 p. m.	950	60	890
12.40 p. m.	800	42	758	1.55 p. m.	950	42	808
12.45 p. m.	825	36	789	2 p. m.	925	30	895
12.50 p. m.	800	42	758	2.05 p. m.	850	54	796
12.55 p. m.	800	42	758	2.10 p. m.	900	114	786
1 p. m.	875	42	833	2.15 p. m.	850	72	778
1.05 p. m.	825	42	783	2.20 p. m.	925	90	835
	800	60	740	2.25 p. m.	1000	90	910
	800	54	746	2.30 p. m.	950	66	884
	875	54	821	2.35 p. m.	850	108	742
	850	48	802	2.40 p. m.	900	90	810
	800	42	758	2.45 p. m.	925	102	823
	750	48	702	2.50 p. m.	900	186	714
	850	54	796	2.55 p. m.	950	162	788
	800			3 p. m.	450	96	354
	875						

Average difference for forty-four observations, 800 volts.

Of the regular series of observations, the following points appear to be noteworthy: Negative values were obtained on March 4th, during light snow; on the 5th, during threatening weather; on the 7th, during heavy rain; on the 9th, during rain; on the 14th, during cloudy weather; on the 17th, during clear weather; on the 18th, during snow; on the 21st and 22d, during rain and snow; on the 24th, during light snow; and on the 31st, during heavy snow.

At Boston, Mass., negative values occurred at 3 p. m. on March 16th, preceding light snow by six hours; on the 17th, preceding snow by five hours, and during the snow; on the 18th, preceding and during rain; on the 19th, at 11 a. m. and 3 p. m., light rain beginning at 11.30 a. m. ending at 1.45 p. m., beginning again at 3.35 p. m. ending at 5.40 p. m.; on the 21st, preceding sleet about fifteen hours; on the 22d, at 3 p. m., preceding rain one hour, and snow the next morning. During the snow the values are positive. On the 24th a negative value occurred at 1 p. m. under a cloudless sky; light snow occurred during the early morning of the 25th; on the 27th, at 3 p. m., a negative value is recorded; light rain began in the early morning of the 28th and lasted until 12.45 p. m.; negative values occur at 1 p. m. and 3 p. m., preceding sleet by nine hours.

At Columbus, Ohio, negative values occur on March 21st, at 1 p. m. and 3 p. m., during fine rain and mist, and do not appear to have any predictive values. Snow on several occasions was accompanied by positive values, apparently average values, not influenced by the occurrence of the snow.

At Ithaca, N. Y., negative values occur on March 1st, and at 11 a. m. and 1 p. m., during threatening weather, but no rain or snow followed, and the indication for the purpose of prediction was misleading. Negative values occur on the 3d, not followed by precipitation; at 1 p. m. on March 5th, light snow, beginning one hour and three-quarters later; on the 6th, at all four observations, light rain and snow, continuing until mid-day; on the 8th negative values at all four observations, during cloudless weather, and not apparently reconcilable with any change in the weather. On March 10th, at all four observations, during threatening weather and preceding snow twenty hours; on the 14th negative values are recorded at 9 a. m., 11 a. m., and 1 p. m., and a very high positive value at 3 p. m. Sleet began early in the morning, ending at 10 a. m., and snow began at 2 p. m., continuing that day and the next; on the 16th, at 11 a. m., a negative value was recorded, and light snow began three hours later. Snow on the 17th was accompanied by positive values. Snow on the 18th was not preceded by negative indications, but was followed on the 19th by low positive and negative values during threatening weather, which, it may be noted, continued for some time, but unaccompanied by precipitation. Low positive values on the 21st precede snow

on the 22d. The values during the snow are positive, increasing with the continuance of the snow. Following the snow negative and low positive values; on the 25th negative values precede snow by at least ten hours; on the 27th low positive values, preceding, and on the 28th negative values during, light rain.

At New Haven, Conn., light snow on March 1st was not preceded, accompanied, or followed, by any marked change in the character of the electrometer readings. Low positive values on the 9th precede rain by nine hours, and large negative values occur on the 10th during the rain, turning to positive when the rain ended. Low positive values are recorded on the 17th, preceding light snow; on the 21st low positive values precede rain by nine hours, and rain and snow on the 22d are accompanied by negative and positive values. The following conditions on this date are noteworthy: snow began at 8.50 a. m. and ended at 10.30 a. m., beginning again at 1 p. m.; rain began at 11.20 a. m., ending sometime in the afternoon, begin-

ning again at 6 p. m. The four recorded values are —135.4, 22, 3.8, and 94.2 volts. Rain on the 28th is accompanied by high negative values, turning to low positive when the rain had ended, and increasing in value, although rain began again at 6 p. m.

At Baltimore, Md., where a continuous record is maintained, the most violent disturbance occurred from 5.40 p. m. of the 21st to 11 a. m. of the 22d, during which, for a considerable time, the fluctuations exceeded the limits of the record, 700 volts on either side of the zero. A disturbance of large amplitude, but small duration, occurred from 9.30 p. m. of the 13th to 2.40 a. m. of the 14th. On other dates disturbances occurred, particularly on the 5th, from 3 p. m. to 6.30 p. m.; on the 7th from 8 a. m. to 11 a. m.; and on the 9th from 1 p. m. to 11 p. m. Chart vi shows, in the first diagram, the observations made simultaneously at the Monument and the Sig-Office, and on the other diagrams the observations for the month at Boston, Mass., and at Ithaca, N. Y.

OPTICAL PHENOMENA.

HALOS.

Solar and lunar halos were observed on the 3d and 4th at the majority of stations in Iowa, Illinois, Indiana, southern Wisconsin and Michigan, Ohio, New York, and Massachusetts, preceding and accompanying in these states the highest pressure of the month, and followed in the Lake region and New England on the 4th and 5th by a severe cold wave. During the presence of these halos cirrus and cirro-cumulus clouds, with light haze, prevailed.

On the 6th lunar, and on the morning of the 7th solar, halos were observed at a number of stations in the Lake region and Ohio Valley; they were followed by a steady rise in pressure, the mercury at different stations within these districts rising two to four-tenths of an inch during the succeeding twenty-four hours.

The storm of the 24th was preceded in New England, the middle Atlantic states, and lower lake region by cirro-stratus and cirro-cumulus clouds, with solar halos, which were reported from a number of stations. During the 25th and 26th this low area was succeeded over the northeastern quarter of the United States by rapidly rising pressure, and from the 27th to 29th by a general cold wave, which extended over the greater part of the country. The area of high pressure was accompanied on the 25th and 26th by solar halos which were reported on the 25th from a number of stations in the Ohio and upper Mississippi valleys, and on the 26th, with haze, from sta-

tions in the lower lake region, Ohio valley, and south Atlantic states.

Lunar halos were reported from a large number of stations in the lower lake region and the upper Mississippi valley on the 30th and 31st; those of the 30th were followed by rising pressure.

The phases of the moon (Washington mean time) during March, as given in "The American Ephemeris and Nautical Almanac" for 1887, are as follows: New moon, 23d, 23 h. 1.5 m.; first quarter, 2d, 7 h. 59.5 m., and 31st, 20 h. 44.6 m.; full moon, 9th, 3h. 25.7 m.; last quarter, 15th, 20 h. 33.9 m.; perigee, 9th, 7.0 h.; apogee, 23d, 1.7 h.

MIRAGE.

Fort Maginnis, Mont.: from 10 a. m. until noon of the 4th a very distinct mirage was visible toward the southwest, bringing into view the valley of the Yellowstone River, which is over sixty miles distant. With the aid of a field glass, hills and cañons, covered with undergrowth, were plainly seen.

Mirages were also observed at the following places:

Arizona.—Willcox, 27th, 28th, 29th.

Dakota.—Parkston, 10th, 11th, 24th, 31st; Webster, 1st, 16th, 17th, 18th.

Kansas.—Salina, 1st, 2d, 4th, 7th, 8th, 9th, 15th, 30th; Wakefield, 23d.

Nebraska.—Fairbury and Marquette, 1st.

North Carolina.—Reidsville, 14th, 17th.

MISCELLANEOUS PHENOMENA.

FOREST AND PRAIRIE FIRES.

Forest and prairie fires occurred at the following places:

Fort Reno, Ind. T., prairie fires, 1st, 2d, 16th, 17th; Duke, Fla., forest fires, 1st, 24th; Yankton, Dak., prairie fires, 9th, 10th, 11th, 15th, 16th, 17th; Wytheville, Va., fires on the mountains, 12th, 14th; Hay Springs, Nebr., prairie fires, 13th to 16th; North Platte, Nebr., prairie fires, 14th, 15th, 19th to 24th, 29th; Archer, Fla., forest fires, 16th to 19th, 22d; Pike's Peak, Colo., prairie fires toward the southeast, 22d, 23d, 24th; Fort Meade, Dak., timber fire in the southeast, 23d; Fort Elliott, Tex., prairie fires, 24th, 25th, 29th; Ninnescah, Kans., prairie fires, 25th to 28th; Fort Sill, Ind. T., prairie fires, 27th; Alva, Fla., forest fires, 31st.

METEORS.

Huron, Dak.: at 10.40 p. m. of the 12th a brilliant meteor was seen moving from a point about 20° above the southern horizon. It moved slowly, and parallel to the horizon, disappearing at a point south of west, and leaving a line of bluish

light, with numerous brilliant sparks. The observer states that the meteor was visible about one minute.

Escanaba, Mich.: at 10.05 p. m., of the 14th a brilliant meteor was seen starting from a point near the zenith and moving northwesterly about 45°, when it disappeared.

Meteors were also reported to have been observed at the various stations, as follows: Fort Thomas, Ariz, 13th; Keeler, Cal., 23d, 28th; Nicolaus, Cal., 26th; Parkston, Dak., 12th; Quitman, Ga., 14th; Pekin, Ill., 25th; Vevay, Ind., 25th; Clinton, Iowa, 18th; Monticello, Iowa, 19th; Cedar Rapids, Iowa, 25th; Woodstock, Md., 8th, 11th, 14th, 20th; Escanaba, Mich., 14th; Kalamazoo, Mich., 22d, 31st; Moorhead, Minn., 13th; Beverly, N. J., 1st, 2d; Menands, N. Y., 1st; Hiram, Ohio, 10th, 11th; Mount Angel, Oregon, 20th; Stateburg, S. C., 24th; Cleburne, Tex., 14th; Salt Lake City, Utah, 18th; Poulney, Vt., 29th; Rappahannock Va., 11th; Variety Mills, Va., 23d; Embarras, Wis., 18th; Delavan, Wis., 24th; La Crosse, Wis., 31st.